

Bulletin of the New York Mathematical Society, vol. ii. No. 2, November 1892.—This number practically consists of one paper, and that a very interesting one, by Dr. Emory McClintock, "On the Non-Euclidian Geometry," a subject which has been more than once brought before our readers. In vol. viii. (1873) appeared Clifford's translation of Riemann's Habilitationsschrift "ueber die Hypothesen welche der Geometrie zu Grunde liegen" (1854). In 1883 this geometry was considered in Cayley's British Association address, and quite recently (February 25, 1892) in a translation of Poincaré's "Revue Generale des Sciences." "The chief lesson to be obtained from all non-euclidian diversions is that the distinguishing mark of euclidian geometry is fixity of distance-measurement, by which alone it is possible to draw the same figure upon different scales. That the same figure may be drawn upon different scales might well be laid down as the axiom necessary and sufficient to distinguish euclidian from non-euclidian geometry." To this is appended a footnote which says that this is "referred to as 'the axiom of similars' by Sir Richard (sic) Ball in the article 'Measurement' of the "Encycl. Brit." A short article follows on the new logarithmic tables of J. de Mendizábal-Tamborrel (Paris, Hermann, 1891). In addition there are the usual "Notes," but no list of publications.

No. 3, December 1892.—This number contains a careful criticism of Ball's "Mathematical Recreations," with suggestions and discussions by Prof. J. E. Oliver of Ithaca, New York, and an account of Dr. Julius Bauschinger's "Zweites Münchener Sternverzeichniss, enthaltend die mittleren Oerter von 18,200 Sternen für das Aequinoctium, 1880," by Prof. T. H. Safford. "Notes" and "New Publications" follow.

Wiedemann's Annalen der Physik und Chemie, No. 12.—On the temperature coefficient of the electrical resistance of mercury and on the mercury resistances of the Imperial Institution, by D. Kreichgauer and W. Jaeger. The coefficient was measured in the case of the copies of standard resistances already described. The formula obtained for the resistance w_t at temperature t by two independent methods was

$$w_t = w_0 (1 + 0.000875t + 0.0000125t^2)$$

—Generation of electricity by friction of gases against metals, by K. Wesendonck.—On galvanic polarization at small electrodes, by F. Richarz.—Electric oscillations in wires, direct measurement of the moving wave, by Kr. Birkeland. The oscillations were produced in two copper wires running parallel to each other at a distance of 80cm. They were 30m. long, and ended in one direction in brass plates 40cm. square, facing two similar plates connected with the terminals of the spark gap of a powerful induction coil. The potentials along the wire when the coil was working were determined by measuring the length of the sparks crossing between the knobs of a spark micrometer, one of them being connected with the wire by a sliding contact, the other leading through a telephone to earth. Static effects on the telephone were made inappreciable by laying a thread moistened with dilute sulphuric acid across the wires near the "collector" plates. Under these circumstances the passage of sparks was immediately indicated by the telephone, and their length could be measured down to 0.0005mm.—Determination of dielectric constants by means of the differential inductor, by Oscar Werner.—Measurement of resistances by means of the telephone, by Max Wien.—Diffusion of light by rough surfaces, by Christian Wiener. Experiments made on cast gypsum show that Lambert's law of diffusion, according to which the brightness of a surface is independent of the angle from which it is seen, is not strictly correct. The brightness at the edge of a round surface is 0.6 times that given by his law. In the vicinity of reflection points the brightness is greater, and at the greatest brightness the angle of incidence is greater than the angle of reflection.—A unit for measuring intensity of sensation, by the same.—On internal friction of solid bodies, especially metals, by W. Voigt.—Measurement of the coefficient of diffusion of liquids, by F. Niemoeller.—Absolute compressibility of mercury, by G. de Metz.—Propagation of energy through the ether, by G. Helm.—On the utilization and action of the telephone in electrical null methods; reply to Hr. Winkelmann, by E. Cohn.—On the solution of sodium silicates, and influence of time upon their constitution, by F. Kohlrausch.—Behaviour of polarized light in refraction, by G. Quincke.—On a mercury arc light, by L. Arons.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Meteorological Society, December 21.—C. Theodore Williams, President, in the chair.—The following papers were read:—Moving anticyclones in the Southern Hemisphere, by Mr. H. C. Russell, F.R.S., Government Astronomer, New South Wales. The author describes the results of his practical study of the daily weather charts for Australasia, and states that the leading fact brought out is that the weather south of 20° S. latitude is the product of a series of rapidly moving anticyclones, which follow one another with remarkable regularity, and are the great controlling force in determining local weather. These anticyclones are more numerous in summer than in winter, the average number for the year being 42. They usually take seven or eight days to travel across Australia in summer, and nine or ten days in winter; the average daily rate of translation being 400 miles. The shape of the anticyclone appears to undergo some modification as it nears the east coast. The winds on the north side of the anti-cyclone are not so strong as those on the south side, and the intensity of the weather is in proportion to the difference in pressure between the anticyclone and the V-depression, but the relation of the pressures varies frequently before the wind responds, the pressure appearing to be controlled from above by the more or less rapid descent of air which feeds the anticyclone. Cyclonic storms are very unusual, and do not occur more than once in two or three months.—The tracks of ocean wind systems in transit over Australasia, by Capt. M. W. C. Hepworth. The author has examined the daily weather charts of Australia and New Zealand, and has prepared maps showing the daily positions of the centres of high and low pressures for a whole year. He finds that the wind systems, which make their first appearance to the westward and south-westward, advance to the eastward rapidly, and frequently very rapidly, during the winter months, but during the summer months they usually move more slowly, and not unfrequently recurve. Their progress is retarded by contact with the areas of high pressure which they encounter; the mean of the tracks of these anticyclones, moving also from west to east, appears to be across the southern portion of Australia and onward, crossing the islands of New Zealand during the winter months, but to the southward of Western and South Australia, across Victoria and New South Wales, and thence to the north-eastward, avoiding New Zealand during the summer months.—Rainfall of Nottinghamshire, 1861–90, by Mr. H. Mellish. The author has collected and discussed all the rainfall records made in the county during the thirty years, and finds that in the extreme west the mean rainfall is 27 inches or more, and that over the rest of the county it varies between 25 and 27 inches, except north of the Manchester, Sheffield and Lincolnshire Railway, where the rainfall is less than 25 inches, and in the north east towards Gainsborough, where it is not more than 23 inches. The year of greatest rainfall was 1872, and of least rainfall 1887. October is the wettest month and February the driest.—A new instrument for cloud measurements, by Dr. Nils Ekholm.

Geological Society, December 21, 1892.—Prof. J. W. Judd, F.R.S., Vice-President, in the chair.—The following communications were read:—On a Sauropodous Dinosaurian vertebra from the Wealden of Hastings, by R. Lydekker. In addition to *Hoplosaurus armatus* and *Pelerosaurus Conybearei*, there is evidence of another large Sauropodous Dinosaur in the Wealden, now known as *Morosaurus brevis*. Up to the present time it has been impossible adequately to compare *Hoplosaurus armatus* with *Morosaurus brevis*; but recently Mr. Rufford has sent to the British Museum an imperfect dorsal vertebra of a large Sauropodous Dinosaur from the Wealden of Hastings, which enabled the required comparison to be made. The author describes the vertebra, contrasts it with that of *Hoplosaurus armatus*, and gives presumptive evidence that it should be referred to the so-called *Morosaurus Becklesi* (Marsh), which apparently cannot be separated from *M. (Cetiosaurus) brevis*. He has not been able to compare Mr. Rufford's specimen with the dorsals of the American *Morosaurus*, in order to discover whether the English Dinosaur is correctly referred to that genus. This paper led to a discussion, in which the chairman, Mr. Hulke, Prof. Seeley, Mr. E. T. Newton, and the author took part.—On some additional remains of Cestraciant and other fishes in the Green Gritty Marls, immediately overlying the Red Marls of the Upper Keuper in Warwickshire, by the Rev. P.

B. Brodie. The vertebrate remains occur in a very thin band of marly friable sandstone lying between two beds of green marl, though in some places the same bed has itself no admixture of sandy material. Bones and teeth are so numerous that it might almost be called a bone-bed. It does not exceed three inches in thickness. It contains ichthyodorulites of Cestraciont fishes, abundant palatal teeth of *Acrodus keuperinus*, ganoid fish-scales, and abundant broken bones, some of which may belong to fishes, others to labyrinthodonts, and amongst the latter a fragment of a cranial bone. The Chairman congratulated the Society on the presence of one of its Fellows who had been connected with it for nearly sixty years, and had read his first paper almost half a century ago. He hoped that the Society would still continue to receive communications from the same source of like interest and value. Mr. J. W. Davis, Mr. H. B. Woodward, and Mr. E. T. Newton also spoke.—*Calamostachys Binneyana*, Schimp, by Thomas Hick. Communicated by J. W. Davis.—Notes on some Pennsylvanian calamities, by W. S. Gresley.—Scandinavian Boulders at Cromer, by Herr Victor Madsen, of the Danish Geological Survey. Communicated by J. W. Hulke, F.R.S. During a visit to Cromer in 1891 the author devoted much attention to a search for Scandinavian boulders, and obtained three specimens; one (a violet felspar-porphyr) was from the shore, and the other two were from the collection of Mr. Savin. The first was considered to come from south-east Norway, and indeed Mr. K. O. Björlykke, to whom it was submitted, refers it to the environs of Christiania. The author considered that the two specimens presented to him by Mr. Savin, who had taken them out of Boulder Clay between Cromer and Overstrand, were from Dalecarlia; and these were submitted to Mr. E. Svedmark, who compared one of them (a brown felspar-hornblende-porphyr) with the Grönklitt porphyry in the parish of Orsa, and declared that the other (a blackish felsite-porphyr) might also be from Dalecarlia. This paper was discussed by Mr. C. Reid, Mr. J. W. Davis, the Rev. P. B. Brodie, Dr. Hicks, Mr. Marr, and the Chairman.

EDINBURGH.

Royal Society, December 19, 1892.—Sir Douglas MacLagan, President, in the chair.—Dr. Hunter Stewart read a paper on an extension of Kjeldahl's method of organic analysis, and described an apparatus which he had devised for the estimation of the amount of organic carbon present in water.—Prof. Rutherford read a note by Dr. W. G. Aitchison Robertson on the madder-staining of dentine. Rabbits were fed on madder for some time and were then killed, the dentine being then found to be stained. When other food was supplied for a time, the process of feeding on madder being resumed afterwards, two coloured layers were found in the dentine, with an intermediate colourless layer.—Prof. C. G. Knott read a paper on recent innovations in vector theory. He entered into a critical examination of the anti-quaternionic attitudes taken up by Prof. Willard Gibbs, Mr. Oliver Heaviside, Prof. Macfarlane, and others. His chief arguments were (1) that the quaternion was as fundamental a geometric conception as either its scalar or its vector part—indeed more fundamental; (2) that in the development of his dyadic notation, Prof. Gibbs, being forced to bring the quaternion in, logically condemned his own position; (3) that a really flexible vector analysis must be versorial, the equations $ij = k$, $jk = i$, $ki = j$, &c., being from the geometrical and physical point of view essentially rotational; (4) that the non-associative character of the vector-analysis, in which i^2, j^2, k^2 were assumed to be $+1$, rendered it totally unfit for higher physical research; (5) that this tinkering with the algebraic sign quite spoiled the real efficiency of the very beautiful quaternion operator ∇ —Prof. Gibbs, for example, being compelled to introduce the (supposed) new functions of operation Pot, New, Lap, Max, which in quaternions are the very simplest of inverse functions of ∇ , and are best expressed as such.

DUBLIN.

Royal Dublin Society, December 21, 1892.—Prof. A. C. Haddon in the chair.—Prof. Sollas, F.R.S., read a paper on pitchstone and andesite from tertiary dykes in Donegal. The author found that a microscopical examination of some remarkably fresh glassy rocks from Donegal revealed a close resemblance between them and rocks of the same age in Arran. This helps to confirm the supposed great extension of tertiary dykes through the north-west of Ireland. Prof. Sollas next read a paper on the variolite and associated igneous rocks of Roundwood, co.

Wicklow. He described them as a complex of basic rocks, including altered ophitic dolerite, spilite (variolite du Drac), and spherulitic tachylite (variolite de la Durance). In connection with the epidotisation of the rock the author pointed to the excessive fissuring which it has undergone; and showed that the formation of epidote is attended with considerable diminution of volume, sufficient to account for the cracks. The formation of serpentine and chlorite is attended with expansion, and chlorite can scarcely be formed without the simultaneous liberation of a disproportionately large percentage of quartz. This explains the common association of chlorite with the quartz of quartz veins.—Sir Howard Grubb, F.R.S., described a new system of mounting for monster reflecting telescopes.—Mr. H. H. Dixon read a paper on the germination of seedlings in the absence of bacteria. Seeds, the outer coats of which were sterilized, germinated in the absence of bacteria, and being kept absolutely free from bacteria did not, after growth had ceased, suffer the decay of death, but remained for more than twenty months apparently unchanged. An apparatus for sterilising the outer coats of the seeds and sowing them without the introduction of bacteria was also described.—A paper was communicated by Prof. A. C. Haddon, and Miss A. M. Shackleton, describing some new species of Actiniae from Torres Straits.

BERLIN.

Meteorological Society, December 6.—Dr. Vettin, President, in the chair.—Prof. Assmann gave a detailed description of the meteorographs set up in the "Urania-pillars." Each pillar contains a thermograph, a barograph, and a hygrograph, placed side by side in a metal case through which a rapid current of air is kept up. The thermograph consists of a Bourdon spring, filled with alcohol, whose movements are communicated to an external recording-lever. The barograph is made of four boxes joined together, and delicately balanced by a weight, whose movements are similarly recorded externally. The hygrograph consists of a bundle of hairs 2 m. in length. The above instruments have continued to work well after several months' use. Their chief defect is due to the hygroscopic properties of the paper on which the three levers trace their record. The large amount of material in the shape of meteorograms already collected has revealed a number of interesting facts. Thus, for instance, the temperatures recorded on two closely-adjacent pillars may differ by 1° or more not only on a warm summer day, but also during the night of November 26, the coldest of this year. In one case the air was found to be warmed by the adjacent row of houses exposed to direct sunlight. In another the radiation was observed to be greater opposite a gateway than in the street. The very considerable local differences of air-temperature recorded on closely-neighbouring pillars could scarcely have been *à priori* expected.

Physiological Society, December 9, 1892.—Prof. du Bois Reymond, President, in the chair.—Prof. Exner, of Vienna, gave a résumé of his researches on the innervation of the crico-thyroid muscle in rabbits and dogs. In each he had found a branch from the pharyngeal branch of the vagus distributed to this muscle, together with the superior laryngeal nerve, to which he has given the name of median laryngeal nerve. The communication was illustrated by an experimental demonstration.—Dr. Hansemann stated that he had obtained photographs of microscopic objects, which when placed in a stereoscope, presented an appearance of solidity. They were produced by taking one photograph of the object in focus for a given level, and then a second photograph at a different level. These photographs united stereoscopically gave the impression of solidity.—Prof. Hilgard drew attention to the remarkable fact that the most civilized races of antiquity usually established themselves in dry districts. This he attributed to the fact, borne out by numerous analyses of soils in America, that in dry regions the earth is far richer in mineral food-stuffs necessary to plant life than in wet regions where these are largely washed out of the soil. Hence in dry regions simple irrigation suffices to produce a luxuriant vegetable growth, while on the other hand the soil of moist regions is very rapidly exhausted.

PARIS.

Academy of Sciences, January 9.—M. de Lacaze-Duthiers in the chair.—Drainage waters of cultivated lands, by M. P. P. Dehérain. An experimental investigation of the substances found in water drained from various cultivations showed that all the waters contained a fair proportion of nitrates. Even beet-root, which not only utilizes nitrogen for the formation of its

albuminoids, but also stores nitrates in its tissues, gave 31, 39, and 95 gr. of nitric acid per cubic metre of drainage water. Beetroot gives, however, the least quantity of nitrogen in the drained water in proportion to the crop. Next comes Turkey corn, and then potatoes. It appears certain that all nitrogen which enters the soil is either assimilated or else lost. In the case of a bad harvest there is a loss both from the poverty of the crop and the impoverished state of the soil.—On the small planets and nebulae discovered at the Nice Observatory by MM. Charlois and Javelle, and at the Mounier observing station, by M. Perrotin. A list of eight minor planets discovered by the photographic method in four weeks, *i.e.* one-sixteenth of the time necessary to achieve the same result by eye observation.—Dilatation and compressibility of water, by E. H. Amagat. Tables are given showing the relative volumes of a quantity of water at pressures varying from 1 to 3000 atmospheres and temperatures ranging from 0° to 198°; and others showing the compressibility of water under the same conditions. This is seen to vary inversely as the pressure, and also inversely as the temperature up to very high pressures, when it begins to increase with the temperature.—Observations of Brooks's comet (November 19, 1892), made at the Paris Observatory (west equatorial), by M. O. Callandreaux.—Observations of solar phenomena, made at the observatory of the Roman College during the third quarter of 1892, by M. P. Tacchini.—On the reduction of elliptic integrals, by M. J. C. Kluyver.—On the thermal variation of the electric resistance of mercury, by M. Ch. Ed. Guillaume. Pointing out the remarkable agreement of his results with those obtained by Messrs. Kreichgauer and Jäger, at the Physico-Technical Institute of Germany (see *Wiedemann's Annalen*, No. 12).—On the measurement of power in multiphase currents, by M. Blondel.—Absolute value of the magnetic elements on January 1, 1893. The elements for that date, determined at the magnetic observatory of the Parc Saint-Maur, situated in long. 0° 9' 23" E. and lat. 48° 48' 34" N., are the following:—

	Absolute values on January 1, 1893.	Secular variation in 1892.
Declination ...	15° 24' 3"	— 6' 4"
Inclination ...	65° 8' 5"	— 0' 5"
Horizontal force ...	0' 19596	+ 0' 00016
Vertical force ...	0' 42297	+ 0' 00019
Total force ...	0' 46616	+ 0' 00024

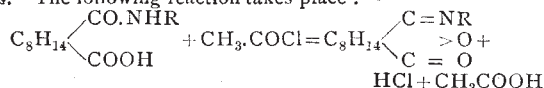
The values for the magnetic and meteorological observatory of Perpignan, long. 0° 32' 45" E., lat. 42° 42' 8" N., are

	Absolute values on January 1, 1893.	Secular variation in 1892.
Declination ...	14° 12' 9"	— 5' 9"
Inclination ...	60° 13' 3"	— 1' 8"
Horizontal force ...	0' 22278	+ 0' 00030
Vertical force ...	0' 38933	+ 0' 00003
Total force ...	0' 44856	+ 0' 00017

—On the purification of arsenical zinc, by M. H. Lescoeur. Zinc destined for toxicological operations can be obtained free from arsenic, antimony, sulphur, and phosphorus by two successive operations, *viz.* oxidation by means of nitre, and fusion with chloride of zinc.—Combinations of quinoline with the halogen salts of silver, by M. Raoul Varet.—Symmetric dipropylurea and dipropylsulphurea, by M. F. Chancel.—On a substance derived from chloral, or chloralose, and its physiological and therapeutic effects, by MM. Hanriot and Ch. Richet.—On phagocytosis observed on the living animal, in the branchii of the lamellibranch molluscs, by M. de Bruyne.—New observations on the affinities of the different groups of gasteropods, by M. E. L. Bouvier.—On an anomaly recently presented by the secular variation of the magnetic needle, by M. Léon Descroix.—Influence of motion on the development of fowls' eggs, by M. A. Marcacci.

AMSTERDAM.

Royal Academy of Sciences, December 24, 1892.—Prof. Van de Sande Bakhuisen in the chair.—In a paper read by MM. S. Hoogewerff and W. A. van Dorp, some isoimides of camphoric acid were described. These were obtained by the action of POCl_3 or CH_3COCl on some substituted camphoric acids. The following reaction takes place:—



where R is put for CH_3 , C_2H_5 or C_7H_7 . The isoimides are very unstable; they easily add one molecule of water, re-generating the acids from which they derive. By the action of heat they are transformed into the ordinary imides $\text{C}_8\text{H}_{14} \begin{array}{l} -\text{CO} \\ \text{CO} \end{array} \text{NR}$.

—The same authors called attention to the fact that it seems to be a general reaction of the anhydrides of bibasic acids to dissolve in the aqueous solutions of ammonia and the primary amines, forming the corresponding acid amides: $\text{R} \begin{array}{l} \text{CO} \\ \text{CO} \end{array} \text{O} +$

$\text{NH}_2\text{R}_1 = \text{R} \begin{array}{l} \text{CO.NHR}_1 \\ \text{COOH} \end{array}$. — Mr. Bakhuis Roozeboom dealt

with the solubility-curve for systems of two bodies. The general form of such a curve in its totality, as yet not known even by the researches of Engel, has been encountered by the author and Mr. Schreinemakers in studying the solubility of $\text{Fe}_2\text{Cl}_6 \cdot 12\text{H}_2\text{O}$ in solutions of HCl. The curve is a continuous one, combining the two solubilities of the hydrate, recently made known by the author. It presents a summit when the proportion of Fe_2Cl_6 is the same as in the solid hydrate. Part of the solutions give on water-additions a deposit of the hydrate, part of them give redissolution. The general form of the curve for double salts would be represented in its totality by a closed curve, surrounding the point, indicating the composition of the double salt. With this form the same division of the solutions in regard to their behaviour on water-addition is possible as above.—Prof. Lorentz treated of Stokes's theory of the aberration of light. The hypothesis of M. Stokes, that the movement of the ether admits of a velocity-potential, is in contradiction with the supposition that, at the surface of the earth, the velocity of the ether is equal to that of the planet. It might, however, be doubted whether, in M. Stokes's explanation, the first hypothesis is really necessary. In the present note it is shown that it cannot be avoided.

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